

The Anthrax Solution: The Sverdlovsk Incident and the Resolution of a Biological Weapons Controversy

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From 1979 to 1994, arms control in the field of chemical and biological warfare (CBW) experienced what could be termed a “verification crisis.” With the collapse of the SALT regime in nuclear arms control in the late 1970s and early 1980s, precisely on the issue of how to verify compliance, the international arms control community was uniquely sensitive to issues of arms control verification. The particular nature of CBW – the effects of which seemed to mimic natural outbreaks of disease – only intensified the suspicions of conservatives in the U.S. government about verification and exacerbated the Cold War tensions surrounding this arena of arms control. At this exact time, two CBW-related incidents flared up and brought the verification crisis to a head, two incidents that seemed to bear all the characteristics of illegal uses of biological weapons in violation of the 1972 Biological Weapons Convention (BWC): the Sverdlovsk incident and Yellow Rain.

It would have been comforting for the diplomatic establishment at the end of the 1970s to write off these incidents as isolated moments of hysteria within military and arms-control circles, but these allegations were being raised in an international climate that was quickly shelving such complacency. The Soviet Union had invaded Afghanistan in 1979, ending the brief era of détente, and a series of troubles in the Third World (such as the Iranian Revolution and the election debacle in Chile) made it harder to look at the world optimistically. Realpolitik seemed to have overtaken the previous idealism in international relations. With a conservative Republican victory predicted for the 1980 U.S. presidential election, the kid gloves were off. Furthermore, the complete collapse of the SALT regime after the failure of the Senate to ratify SALT II made the political situation even worse, further highlighting the implications of these alleged violations of the BWC.

Consequently, by 1981 there was extraordinarily little faith in CBW arms control, a remarkable contrast to the great optimism six years earlier in the potential of the Biological Weapons Convention to usher in a new system of international relations and cap a long quest for biological arms control.¹ The Sverdlovsk incident was the first alleged violation to appear in the midst of this climate of distrust. In 1979, an anthrax outbreak in the Soviet city of Sverdlovsk led many Western security officials to conclude that the Soviets had been clandestinely developing biological weapons in violation of the 1972 BWC. Using a variety of tactics, the Soviets managed to demonstrate, for a time, that the outbreak could just as easily be explained by natural causes.

But the U.S. State Department was undaunted. Distrustful of the Soviets and CBW arms control, it shifted to a new set of charges when the Sverdlovsk allegations lost intensity. In 1981, Secretary of State Alexander Haig accused the Soviets of being accomplices in an extermination campaign their Vietnamese allies were conducting in Laos. Supposedly, the Soviets were providing biological toxin weapons for use against the Hmong tribe, which had served as a clandestine army for the United States during the Vietnam War. Journalists appropriated and popularized the term "Yellow Rain" because of the yellow color reported in Hmong refugee testimony, and *The Wall Street Journal* whipped up a public frenzy against the Soviet Union. Based on a large compilation of these refugee stories and a small set of biomedical and environmental samples with alleged residues of fungal toxins known as trichothecenes, the United States began a full diplomatic war against the Soviet Union as a BWC violator and initiated a UN Group of Experts to investigate the affair. But a concerted opposition built up to the Yellow Rain allegations in 1982–1983, conducted by several scientists clustered around Matthew Meselson of Harvard, leading to a fierce debate on the charges that more or less drew to a close by 1986. The fact that such a debate emerged was not so surprising as what Meselson and his associates were claiming. They argued, in a manner most embarrassing for the U.S. government, that the yellow gas allegedly "sprayed" on the Hmong was nothing other than a shower of feces deposited when swarms of local bees defecated. The toxin residue, they declared, was the result of contamination after the fact, and thus not due to any Soviet perfidy. That is, there was no naturally occurring fungal toxin in the feces; trace levels of which resulted either from mishandling in storage or laboratory errors. Yellow Rain was a natural phenomenon, so Meselson claimed, and after substantial confirmation from international – especially Canadian – researchers, the government let its charges wallow in silence, never to raise

¹ On the early history of biological warfare, see Vincent J. Derbes, "De Mussis and the Great Plague of 1348." *J. Amer. Med. Ass.*, 196 (4 April 1966), 179–182.

the issue publicly again.² Although the issue was settled for most individuals concerned, the public tenor of the debate and the humiliating "bee feces" story remained in the thoughts of many – especially government hawks and members of the *Wall Street Journal* editorial board – and would return as a reminder and exemplar in the Sverdlovsk incident later, as we shall see.

As the international climate became less tense after 1986, the Soviets released new data on Sverdlovsk, reconfirming their original position and generating wide support in the West. Soon, however, accounts of the 1979 outbreak by Soviet journalists began to generate new doubts as to the Soviets' veracity, sparking another debate that was not resolved until 1994. This article examines the history of the Sverdlovsk incident, and how its peculiar nature impacted on the reformulation of a verification philosophy both for the Biological Weapons Convention and for the nascent Chemical Weapons Convention (CWC). The net result of this reformulation was an entrenchment of independent scientists as a means for establishing the "truth" of CBW violations. Both before and after consensus was reached, it was evident to what a strong degree of standards of evidence and evaluation were created by the political climate. In a sense, both the U.S. State Department and its opponents clamored for some form of objective resolution to their dispute without recognizing the impossibility of such a goal in a tense political area.

Releasing the Charges: Sverdlovsk until March 1980

The city of Sverdlovsk had long been a mystery to Western observers, even in the late 1970s. Those few who knew of its existence viewed it as a city closed to the West, a center of military and industrial production for the Soviet Union located in the Soviet Urals, straddling the border between Europe and Asia (Figure 1). Scholars of Soviet history recalled it as the former (and now renamed again) Ekaterinburg (after Empress Catherine I), where the Romanov family was murdered. By and large, however, Sverdlovsk was ignored as peripheral to the main diplomatic and military center of the Soviet Union – Moscow.

In April 1979, all that began to change. The Central Intelligence Agency (CIA) of the United States observed several unusual developments in Sverdlovsk but hesitated to take visible action. The public at large remained

² The vicissitudes of the Yellow Rain affair is discussed by me in "The Yellow Rainstorm: Politics, Chemical Warfare, and the Quest for Legitimation," unpublished manuscript. For a discussion of this pendulum-like swaying of U.S. allegations as soon as any particular controversy lost momentum, see Leonard Cole, "Sverdlovsk, Yellow Rain, and Novel Soviet Bioweapons: Allegations and Responses," in *Preventing a Biological Arms Race*, ed. Susan Wright (Cambridge, Mass.: MIT Press, 1990), pp. 199–200.



Figure 1. Map of the European half of the Soviet Union. Sverdlovsk is located in the Ural Mountains about 1400 kilometers east of Moscow. Novosibirsk (not shown) is farther east. (Reprinted with permission from Eliot Marshall, "Sverdlovsk: Anthrax Capital?" *Science*, 240 [22 April 1988], 384. Copyright 1988 American Association for the Advancement of Science.)

in the dark about Sverdlovsk until October 1979, when the Russian émigré journal *Posev* published an article about a disaster in the Soviet Union of the greatest magnitude: an outbreak of disease due to a biological weapons accident.³ *Posev* misreported the incident as taking place in the city of Novosibirsk, a major industrial and scientific center in Siberia: "[I]n June of this year in the southern outskirts of Novosibirsk there was an accident at a factory which developed or researched bacteriological weapons." *Posev* estimated the number of dead at one thousand, most of whom were workers in the

³"Bakteriologicheskaya aviariya v Novosibirsk," *Posev*, 35 (October 1979), 9.

factory or those caught in the downwind drift of germ spores. Beyond these few details, the article was silent, especially about its sources.

Within weeks the story was picked up by the major British news magazine *Now!* The magazine perpetuated the error of locating the outbreak in Novosibirsk and embellished the report with gory details about disfiguring brown patches on corpses in sealed coffins. Using skin necrosis as a diagnostic sign, the authors speculated about Soviet research into viral diseases that could cause skin discoloration, such as Ebola, Marburg disease, and Lassa fever.⁴ The accusations had been made in English for the first time: the Soviets were conducting clandestine research on biological weapons and had suffered a severe accident.

The main problem with the accusations was that they were absolutely and unambiguously false: the outbreak could not have happened in Novosibirsk. Novosibirsk was not a closed city, especially to scientists, and a disaster of this magnitude could not have been covered up. Given that *Posev* was a foreign dissident magazine, it had been forced to gather information through unreliable underground testimony, sometimes tenth-hand at best. In January 1980, *Posev* published a follow-up article, correctly relocating the accident to the mountain city of Sverdlovsk: there had been an accident in Soviet Military Village Number 19 in Sverdlovsk, which released into the wind a strain of disease known as either U-21 or V-21. The release led to enormous casualties southward down to Kashino. People flooded into hospitals with 42 °C (107.6 °F) fevers and died at the rate of thirty to forty per day: the final death toll approached one thousand. Thoroughgoing sanitation measures were undertaken, including the killing of stray animals and the paving of roads, but with little success. The Sverdlovsk city government denied that anything was wrong.⁵ The story was picked up in the 13 February 1980 issue of *Bild Zeitung*, a Hamburg tabloid. Soon Sverdlovsk was on the lips of all interested in biological warfare, but the information released was still based on only the two meager *Posev* articles.⁶

Meanwhile, the U.S. intelligence services were gathering their own evidence. The developments in Sverdlovsk, however surprising they might seem, were not totally unexpected. According to official statements, the Soviet Union had renounced biological weapons as of 24 June 1975.⁷ Nevertheless,

⁴David Floyd with John Fullerton and David Loshak, "The Great Russian Germ War Disaster," *Now!*, 26 October 1979, pp. 54-55.

⁵N. N., "Sverdlovsk byl snova na grani gibeli," *Posev*, 36 (January 1980), 7-8.

⁶Zhores Medvedev, "The Great Russian Germ War Fiasco," *New Scientist*, 87 (31 July 1980), 360.

⁷Ambassador Roshchin issued the official notice: "[C]ompliance with the provision of the [Biological Weapons Convention], which was ratified by decree of the Presidium of the Supreme Soviet dated 11 February 1975, is guaranteed by the appropriate State institutions

in 1976, one year after the multilateral disarmament of biological weapons (BW), the United States began to suspect that the Soviets were clandestinely restocking their biological arsenal. On 15 October 1976, *Boston Globe* correspondent William Beecher, known for his excellent connections within the intelligence community, stated that U.S. reconnaissance satellites had detected six suspected BW facilities at Zagorsk, Omutninsk, Pokrov, Berdsk, Aksu, and Sverdlovsk. The plants "feature extremely high smokestacks and refrigerated storage bunkers, associated with germ-warfare production."⁸ Several other contemporary reports also named Sverdlovsk as a key biological weapons production center. A comparative analysis of the various sources of information by a science journalist, however, confirmed that it would be nearly impossible to verify the truth of these allegations.⁹

The general American consensus, however, was that the Soviets had been skirting the terms of a major arms-control agreement. The history of biological arms control is a long tale of struggle and inefficacy. The first attempt to control wartime use of BW came in the Geneva Protocol of 1925, the terms of which were relatively clear: it banned the use of CBW between signatories during wartime. Primarily designed in response to the enormous casualties of gas warfare during World War I, the provision against BW was attached as a rider by the Polish delegation and was then promptly ignored in debate, which instead focused on chemical weapons. As far as BW was concerned, no one cared enough to think of the protocol as anything less than a total ban; for CW, however, the distinctions were finer.¹⁰ When the United States Senate rejected the protocol on 12 January 1926, it did so on the grounds of the deterrent effect of chemical weapons (and at the insistence of the U.S. Army Chemical Corps), not because of the need for biological-weapons deterrent.¹¹

of the USSR. At present, the Soviet Union does not possess any bacteriological (biological) agents or toxins, weapons, equipment or means of delivery, as referred to in Article One of the Convention." Quoted in Nicholas A. Sims, *The Diplomacy of Biological Disarmament* (New York: St. Martin's Press, 1988), p. 53.

⁸ William Beecher, "Logging Arms Tests Crucial," *Boston Globe*, 15 October 1975, p. 18.

⁹ "One difficulty [in conducting such an evaluation] is that officials likely to be the source of such statements are harder to reach than those likely for institutional reasons to be skeptical of them. Thus the balance of information obtained may not exactly represent the exact situation." Nicholas Wade, "Biological Warfare: Suspicions of Soviet Activity," *Science*, 192 (2 April 1976), 40.

¹⁰ For example, there was substantial ambiguity as to what counted as CW in the first place. The main focus of the debate was whether tear gas and herbicides, the two primary CW methods used by the United States in Vietnam, should be considered as CW under the Geneva Protocol. For an excellent discussion of these issues, see R. R. Baxter and Thomas Buergenthal, "Legal Aspects of the Geneva Protocol of 1925," *Amer. J. Internat. Law*, 64 (1970), 856.

¹¹ Bernard J. Brungs, "The Status of Biological Warfare in International Law," *Military Law Review*, 24 (1 April 1964), 50-51. Note that this article was written both before the drafting of the BWC in 1972 and the U.S. ratification of the Geneva Protocol (with reservations) in

The reservation by many signatories of the right to retaliate in kind to CBW sapped the protocol's strength, reducing it to a no-first-use document. The major importance of the protocol lay not in its efficacy, however, but in its role as the bedrock upon which all future attempts for CBW arms control rested. As a result, several of its major flaws have been perpetuated in other treaties, the most salient of which being the lack of any verification or compliance mechanisms.¹²

While the United States may not have been a formal signatory of early international arms control, it did take considerable unilateral steps toward achieving biological disarmament many years later. In 1969, after long consultations with the Pentagon and with the occasional memorandum from Henry Kissinger's Harvard colleague Matthew Meselson, President Richard Nixon announced that the United States would unilaterally destroy all its BW stocks and cease any new production (a provision extended to toxin weapons, naturally produced poisons, in 1970). Furthermore, a moratorium was placed on CW production, although stockpiles would be preserved, thus unilaterally capping what had been a decades-long buildup of chemical weapons by both the United States and USSR.¹³

Matthew Meselson also came to play a crucial role in the Sverdlovsk story. He became interested in science and arms control while studying physical chemistry with Linus Pauling at the California Institute of Technology in the late 1950s.¹⁴ He eventually became a professor of biochemistry and molecular biology at Harvard University, although his specific interest in CBW began amidst the mass emigration of Harvard academics to Washington, D.C., under the Kennedy administration, Meselson became a consultant for the Arms Control and Disarmament Agency (ACDA) in 1963, and there began to lobby against BW because proliferation of these weapons massively heightened

1975. Nevertheless, because there have been no comprehensive reviews of the status of BW in international law since this article, it provides the most in-depth analysis available.

¹² Joseph B. Kelly, "Gas Warfare in International Law," *Military Law Review*, 27 (1 July 1960), 1-67.

¹³ After the fact, some evidence emerged that this decision by Nixon was actually influenced by Soviet double agents, nicknamed "Fedora" and "Top Hat," who told Nixon that if he did not scale back CBW development, the Soviet Union would be compelled to undergo a crash development program. Nixon is said to have pronounced the ban out of fear of Soviet militarization. However, Nixon maintained that the decision was good on its own merits, and declined further comment. David Binder, "Bid to Mislead Nixon Laid to Soviet Spies," *New York Times*, 4 June 1978, p. 18.

¹⁴ At Caltech, Meselson and Frank Stahl, another graduate student, carried out an important experiment that demonstrated the semiconservative replication of DNA by differential centrifugation of isotopically labeled DNA. This established a considerable name for him in molecular biology.

American vulnerability to successful foreign attack.¹⁵ In 1969, Meselson's campaign met with success in the Nixon moratorium. Many individuals gave Meselson credit for almost single-handedly halting the BW arms race.¹⁶

Heavily influenced by Meselson, the U.S. stance allowed for the successful negotiation in 1972, and implementation by 1975, of the Biological Weapons Convention. This treaty, the first complete disarmament treaty of a category of weapons ever, and one of the first multilateral arms-control treaties of its kind, formed the foundation of all biological arms control and the basis for challenging the USSR on Sverdlovsk. The BWC was spawned during the Nixon-Brezhnev political thaw and bore a similar character to the other treaties of its ilk, such as the Sea Bed Treaty (banning militarization of the ocean floor) and the Outer Space Treaty (banning the placing of nuclear weapons beyond the atmosphere): all were negotiated multilaterally under the aegis of the United Nations, and all banned forms of warfare that there had always been reluctance to employ. As a result, no one expected any violations; so, like all classic multilateral treaties, the BWC's language is lax and the verification measures are virtually nil.

As the context within which the debate over Sverdlovsk took place, the BWC plays a central role in the events that followed. Article I of the treaty holds that states party to the convention undertake

never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

- (1) Microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;
- (2) Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.¹⁷

While the treaty is categorical about *what* it is banning, the activities it bans are less well defined: it does not explicitly ban *use* of these weapons, and research is not banned per se. Since almost any research can be seen to have

¹⁵ See Anne Fadiman, "Yellow Rain," *Life Magazine*, August 1984, p. 24. For a discussion of Meselson's long-standing opposition to BW, see Jerry Bishop, "Storm Over Asia," *Wall Street Journal*, 19 June 1983, p. 60.

¹⁶ One such individual was scientist and science writer Freeman Dyson: "The man who did more than any other single person to rid the world of biological weapons is Matthew Meselson, professor of biology at Harvard. . . . Seldom in human history has one man, armed only with the voice of reason, won so completely a victory." Freeman Dyson, *Disturbing the Universe* (New York: Harper Colophon Books, 1979), pp. 173-176.

¹⁷ The treaty is reprinted in Jozef Goldblat and Thomas Bernauer, *The Third Review Conference of the Biological Weapons Convention* (New York: United Nations, 1991), pp. 32-33.

"prophylactic, protective or other peaceful purposes," the treaty might not ban anything short of full-blown production.

The next few articles clarify the first. Article III bans the transfer of weapons or BW production technology to another country. Articles V and VI mandate consultation and cooperation in the event of a suspected violation, the investigation of which is to be conducted by the UN Security Council (a clause that was invoked during the Yellow Rain episode). Articles VIII and IX reaffirm the goals of the Geneva Protocol and commit all signatories to negotiating a Chemical Weapons Convention "in good faith." Finally, Article XII mandates review conferences to clarify ambiguities in the treaty and to propose amendments.

This, then, was the treaty that many suspected the Soviets of violating. As usual, there was a profusion of theories that tried to explain why the Soviets would do such a thing. Soviet émigrés in the United States claimed that the Soviets had never stopped their biological armament in the first place. According to Mark Popovskiy, a science writer who emigrated in the late 1970s, in his widely read work on the Soviet science establishment, scientists had long become enmeshed in the Soviet state's web of secrecy and had no way to stop such military work. Subsequently, the militarization of science could only accelerate; biological research work (which Popovskiy also placed at Sverdlovsk) was one of these chronically militarized fields.¹⁸

Popovskiy's views were especially important because his testimony formed the core of the only official U.S. government hearing on the Sverdlovsk outbreak. The 29 May 1980 hearing concentrated on the version of the Sverdlovsk events that Popovskiy had heard from a colleague in the Soviet Union. This hearsay evidence was considered corroborative since his sources supplemented the CIA's evidence. Popovskiy, through a translator, summarized the reports:

My friend informed me that an infectious cloud had been driven by wind south from the city, and that no less than 1,000 people had died, both in the city and its suburbs. Residents were vaccinated twice. . . . The nature of the disease was not known, but it was thought to be a virulent form of anthrax. Those who came down with the disease died a few hours after arriving at the hospital.¹⁹

¹⁸ Mark Popovsky, *Manipulated Science* (New York: Doubleday, 1979), pp. 156-157.

¹⁹ U.S. House of Representatives, Hearing Before the Subcommittee on Oversight of the Permanent Select Committee on Intelligence, "The Sverdlovsk Incident: Soviet Compliance with the Biological Weapons Convention?" (29 May 1980) (hereinafter cited as Sverdlovsk Hearings), p. 3.

The disease now had a name – anthrax – the specific nature of which would become particularly important in the events that followed. Popovskiy continued: “On the basis of a large number of facts which were at my disposal in the U.S.S.R., I maintain that the Soviet Union never, either after 1925 [the Geneva Protocol] or after 1975 [the Biological Weapons Convention], carried out its commitment to renounce bacteriological weapons.”²⁰

This was hardly the most convincing argument that could be made. The complete case developed by the Americans was summarized in Leslie Gelb’s 1981 “Keeping an Eye on Russia,” easily the fullest early exposition of the publicly available data. According to Gelb, early in February 1980 the CIA received reports from an “extremely credible” witness (the CIA’s words) who reported secondhand news of the anthrax outbreak.²¹ The early U.S. data, then, seemed to be the application of secondhand testimony to the satellite photographs from the mid-1970s. Other events heightened suspicion of the Soviet Union: Soviet Defense Minister Dmitri Ustinov had made a supposedly unscheduled visit to Sverdlovsk shortly after the outbreak; military quarantines were imposed; and rumors that military physicians were introduced into city hospitals were widespread.²² The CIA’s other evidence remained classified. Still, the United States did not yet see fit to raise the issue publicly.

In the meantime, several observers of the Sverdlovsk outbreak were frustrated by the apparent apathy of the United States. Why the delay? Walter Hahn has suggested that the “mind-set” of détente kept the United States hoping that Sverdlovsk would just blow over, similar to the dismissal of the lengthy list of SALT violations. Others, such as U.S. Representative Les Aspin, considered the delay a matter of timing: the United States had abstained from comment while SALT ratification was still possible, but as soon as the shifting conservative climate precluded ratification, the State Department broke from silence and accused the Soviets.²³ Whatever the reason, it was not until March 1980 that the United States took action.

March 1980 was a crucial month. From 7 to 21 March, the First Review Conference of the BWC occurred in Geneva. This conference, sandwiched between the invasion of Afghanistan and the U.S. boycott of the Moscow Summer Olympics, was the scene of high international tension. If the United

²⁰ Ibid., p. 4.

²¹ Leslie Gelb, “Keeping an Eye on Russia,” *New York Times Magazine*, 29 November 1981, p. 59. It is possible but not certain that the CIA’s source was the same as the source of the *Posev* articles.

²² Ibid., p. 60. Mark Hopkins, “The Sverdlovsk Incident,” *New Leader*, 63 (2 June 1980), 11–12.

²³ Walter F. Hahn, “A National Scandal?” *Strategic Review*, 8 (spring 1980), 10. Les Aspin, Sverdlovsk Hearings, p. 1.

States needed a perfect time to publicly accuse the Soviet Union of a BW incident, this was it.

On 17 March 1980, as the conference drew close to drafting its final statement, representatives of the Carter administration privately asked the Soviet delegates for an explanation of the previous spring’s outbreak at Sverdlovsk.²⁴ Not giving the Soviet Union time to respond, David Passage, a State Department spokesperson, announced on the following day: “There have been some disturbing indications that an outbreak of disease in the Soviet city of Sverdlovsk in the spring of 1979 may have resulted from inadvertent exposure of large numbers of people to some sort of lethal biological agent.”²⁵ Now that the charge was public, Ambassador Charles Flowerree, the U.S. representative to the conference, was obliged to make a statement for the record:

Article Five of this Convention stipulates that states Parties undertake to consult one another and to cooperate in solving any problems which may arise. My government has initiated such consultations with the Soviet Union as the result of information received over a period of months, some of it quite recently. This information raises a question as to whether a lethal biological agent was present last year in the Soviet Union in quantities inconsistent with the provisions of the Convention.²⁶

The Soviets were furious. They had never before been proven to have violated an arms-control treaty, and while the Flowerree démarche hardly came close to proof, it was a powerful accusation at a vulnerable moment. In an unprecedented move, the Foreign Ministry of the Soviet Union called wire agencies that very night (reaching the first of them at 6:05 P.M. – well after the ministry’s closing time) and issued its official statement. This amounted to little more than an assertion of innocence and a questioning of U.S. motives in making the charges.²⁷ Many reports linked the U.S. démarche to anti-Soviet propaganda on Afghanistan.²⁸ But this cannot be the whole story. After all,

²⁴ Elisa D. Harris, “Sverdlovsk and Yellow Rain: Two Cases of Soviet Noncompliance?” *International Security*, 11 (1987), 45.

²⁵ Bernard Gwertzman, “Soviet Mishap Tied to Germ-War Plant,” *New York Times*, 19 March 1980, pp. A1, A14.

²⁶ Charles C. Flowerree, “Possible Implications of the Outbreak in Sverdlovsk on Future Verification of the Biological Weapons Convention: A US Perspective,” in *Views on Possible Verification Measures for the Biological Weapons Convention* ed. S. J. Lundin (Oxford: Oxford University Press, 1991), pp. 108–109.

²⁷ David K. Willis, “Soviets: ‘US Double-Crossed Us on Germ Warfare Charges,’” *Christian Science Monitor*, 28 March 1980, p. 10.

²⁸ Bernard Gwertzman, “Soviet Lays Outbreak of Illness to Bad Meat, Not Germ-War Plant,” *New York Times*, 21 March 1980, p. A6.

the invasion had happened so much earlier that it hardly made sense to sit on Sverdlovsk if the United States was trying to score propaganda points. In fact, the behavior of the United States at Geneva was characterized as rather low profile, despite Passage's blunder. The United States did not want to pressure the conference into reviewing Sverdlovsk (probably because it did not yet feel sufficiently confident of its own evidence). In fact, when the time came for the final declaration, the United States endorsed the view that the treaty had not been violated since implementation, temporarily shelving the Sverdlovsk incident.²⁹

Perhaps we can find an explanation for the U.S. behavior by disengaging from Afghanistan and the BWC and looking instead at the broader context of arms control. First, 1980 was an election year with high anti-Soviet sentiment in the United States. But perhaps the reason that the American diplomats showed their fists and then pulled their punches can be traced to scare tactics used in other arms control negotiation conferences. Specifically, the Nuclear Non-Proliferation Treaty (NPT) was up for review in August 1980. This treaty, which closed the nuclear club at five nations (the United States, China, Britain, France, and the USSR), was seen as vastly more important than the BWC. The BWC was, after all, an unverifiable treaty that accorded with everybody's predisposition not to develop BW, while the NPT was the locus of major conflicting interests. Since international prestige was important for leverage on NPT negotiations, "[m]any of the participants to the conference regarded the affair as a dry run for the second NPT conference in August. . . . [T]he chief significance of the meeting lay rather in the influence it might have on other arms control negotiations."³⁰

Accusing the Soviets in this adversarial manner at the conference, however, almost guaranteed that the Soviets would be uncooperative in resolving the allegations.³¹ The behavior of the scientific community was as confrontational as the U.S. government's. Since some scientists realized that there would be diplomatic difficulties in getting the Soviets to present hard evidence on Sverdlovsk, a science policy journal called for Soviet scientists to offer any evidence they might have under the doctrine of "public inspection." This idea places the burden on individual citizens to ensure that their government is faithful to its international obligations. "Is this possible," the article asked, "only in democratic countries with a free press like our own, or is it also

²⁹ Sims, *Diplomacy of Biological Disarmament* (above, n. 8), p. 159. On the U.S. position that the treaty was still inviolate, see Julian Perry Robinson, "East-West Fencing at Geneva," *Nature*, 284 (3 April 1980), 393.

³⁰ Robinson, "East-West Fencing at Geneva" (above, n. 29), p. 393.

³¹ Julian Perry Robinson, "The Changing Status of Chemical and Biological Warfare," in SIPRI, *World Armaments and Disarmaments: SIPRI Yearbook 1982* (London: Taylor & Francis, 1982), p. 343.

possible in totalitarian countries with completely controlled presses like the Soviet Union?"³² The patronizing tone of the article seemed to show the Soviets that some members of the Western scientific community were taking sides in this debate before the evidence was in, and thus it was hard for the Soviet Union to believe that any released scientific evidence would be examined by a disinterested jury. Indeed, it seemed clear that the bulk of the available evidence was either exculpatory or accusatory depending on one's preconceptions.³³ The Soviets saw no guarantee of an impartial arbiter.

The Soviet Response: The Meat Defense

The Soviets were obliged, however, to respond to the U.S. accusations. The response they took was direct: bad meat caused the Sverdlovsk deaths. This argument strongly relies on the etiology of anthrax. Anthrax is a zoonotic disease – an animal disease that can be contracted by humans. It is caused by the rod-shaped bacterium *Bacillus anthracis*, which is from 3 to 8 μm long and from 1 to 1.2 μm wide, and forms exceptionally hardy spores when exposed to atmospheric conditions.³⁴ This spore-producing ability means that when an animal dies of anthrax, the germs sporulate again and survive in the soil for an exceedingly long time, perhaps for several decades.³⁵ When these

³² "Medical Scientists Should Monitor the Biological Weapons Convention," *F.A.S. Public Interest Report*, 33 (June 1980), 2.

³³ Nicholas Wade, "Death at Sverdlovsk: A Critical Diagnosis," *Science*, 209 (26 September 1980), 1501. This argument, even if true, did not excuse the Soviets from certain clear omissions. For one, anthrax is one of the diseases that has to be reported to the World Health Organization (WHO) when a significant outbreak occurs. The Soviet Union failed to do this. See Hopkins, "Sverdlovsk Incident" (above, n. 22), p. 12.

³⁴ A. B. Christie, *Infectious Diseases* (Edinburgh: E. & S. Livingstone, 1969), p. 752. This is the most comprehensive text on the biology of the anthrax germ.

³⁵ On the hardiness of these spores and their application to military uses, see Defense Intelligence Agency, *Soviet Biological Warfare Threat* ([Washington, D.C.]: Defense Intelligence Agency, 1986), pp. 3–4. Anthrax has a long history as a biological weapons agent. In England, for example, there was considerable effort expended during World War II on producing deliverable anthrax (N-bombs). See Barton J. Bernstein, "Churchill's Secret Biological Weapons," *Bull. Atom. Sci.*, 43 (January/February 1987), 45–50. One of the most infamous episodes in the history of BW testing dates to this period of development, when the British chose to detonate an N-bomb on Gruinard Island off the coast of Scotland. Populated mostly by sheep, all people were evacuated, the bombs were detonated, and all of the sheep died – demonstrating the deliverability of the germs. The negative aspects, however, were overwhelming: the island was still not fit for human habitation until the mid-1980s, when extensive decontamination measures were undertaken to cleanse the soil. Certain areas of the island are still contaminated. The fullest account of this test is in Robert Harris and Jeremy Paxman, *A Higher Form of Killing* (New York: Hill and Wang, 1982), pp. 68–74.

The Americans had their own development program. While not nearly as well endowed as the atomic-bomb project, it was not explicitly hamstrung like the chemical weapons division

microbes are injected into living tissue, they germinate into a virulent form within a few hours, proceeding to build up a toxin that leads rapidly to death.³⁶

There are three routes of transmission of the anthrax bacillus, which is not directly contagious among humans. The first, and by far the most common, is cutaneous anthrax, which enters the body through broken skin contact with contaminated animal products (bones, wool, hair, or skin). A localized sore develops at the point of entry, which then turns the skin black and swells into a large welt.³⁷ A large dose of antibiotics, frequently penicillin, rapidly cures cutaneous anthrax. The remaining two forms are exceedingly rare. The first of these is pulmonary anthrax, which comes from inhaling spores of anthrax into the lungs. This form of transmission has been well studied, since many who worked in factories that card and sort goat and sheep wool inhaled significant amounts of anthrax and contracted the disease. This form also would be the primary route for infection with weaponized anthrax. Finally, there is gastric anthrax, which results from eating poorly cooked meat from infected animals.³⁸ It was the distinction between these last two that drove the bulk of the debate over Sverdlovsk.

The primary concern in the BW arms-control community if there is large outbreak of anthrax is to localize its source.³⁹ For the United States to argue that an explosion at a BW-production facility caused the outbreak in Sverdlovsk, it had to be able to prove that the infections in the population were pulmonary. The Soviets made quite a different claim. Their argument was first presented in a two-page article written by I. S. Bezdenezhnykh and

under President Franklin D. Roosevelt. By the end of the war, there was a small supply of deliverable biological weapons, but the U.S. military was hostile to them and refrained from their use. Since there was no specific need to use them after the war, the program was transferred to peacetime development and was mostly forgotten. Most of the documents involved are still classified. See Barton J. Bernstein, "America's Biological Warfare Program in the Second World War," *Journal of Strategic Studies*, 11 (September 1988), 292-317. Open-air testing of the anthrax germs continued well into the 1960s in Utah. Charles Piller, "Lethal Lies About Fatal Diseases," *Nation*, 247 (3 October 1988), 271-275.

³⁶ Christie, *Infectious Diseases* (above, n. 34), p. 755.

³⁷ The term "anthrax" comes from the ancient Greek for "coal," and the French "charbon" probably has similar roots. It is probable that the origin of these terms comes from the coal-black sores. *Ibid.*, p. 751.

³⁸ Harris, "Sverdlovsk and Yellow Rain" (above, n. 24), p. 44. On inhalational anthrax, see also Philip S. Brachman, "Inhalation Anthrax," *Ann. N.Y. Acad. Sci.*, 353 (1980), 83-93. The predicted death rates for different forms of anthrax vary. For cutaneous anthrax they are 15 to 20 percent of those infected; the prognosis for pulmonary infection is much more grim, rated at well over 90 percent. James Compton, *Military Chemical and Biological Agents* (Caldwell, N.J.: Telford, 1987), p. 361.

³⁹ John Woodall, "WHO Health and Epidemic Information as a Basis for Verification Activities under the Biological Weapons Convention," in *Views on Possible Measures for a Biological Weapons Convention*, ed. S. J. Lundin (Oxford: Oxford University Press, 1991), p. 63.

V. N. Nikiforov in a Soviet journal.⁴⁰ What actually happened in Sverdlovsk, they said, was a naturally occurring epizootic (an epidemic among animals), and the human cases of anthrax came from eating infected meat. Anthrax, they claimed, was endemic to Sverdlovsk, and epizootics occurred frequently, a point backed up by various Western sources as well.⁴¹ On occasion the meat from sick animals entered the human food supply, causing sporadic outbreaks, such as the one in the Siberian town of Yaroslavl from 6 to 17 June 1923, which killed 27 people.⁴² The same had occurred in Sverdlovsk, the authors asserted, although without supporting numbers, graphs, or pictures.

The Soviets added that if there were an outbreak, it would be highly unlikely that Western physicians, who had little experience with this disease, would be able to distinguish its symptoms from pulmonary anthrax. Both are characterized by high fevers and pneumonia-like symptoms, and the West had not seen a gastric case in an extremely long time. A. B. Christie, then the world expert on anthrax, mentioned that "I have never seen a case of intestinal anthrax, and I doubt if anyone working in the temperate zones has." Philip Brachman of the Centers for Disease Control in Atlanta added that there has never been a reported case of gastrointestinal anthrax in the United States.⁴³ If the Soviet doctors said it was gastric anthrax, why should the West doubt it?

⁴⁰ I. S. Bezdenezhnykh and V. N. Nikiforov, "Epidemiologicheskii Analiz Zabolevaniy Siberskoy Yazvoy v Sverdlovsk," *Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii* (*Journal of Microbiology, Epidemiology, and Immunobiology*), 29 (May 1980), 111-113.

⁴¹ Given that 2 percent of the Soviet population inhabited anthrax-infected areas, there was a calculated 5-10 percent probability of an intestinal anthrax outbreak each decade. J. P. Perry Robinson, "The Soviet Union and the Biological Weapons Convention' and a Guide to Sources on the Sverdlovsk Incident," *Arms Control*, 3 (December 1982), 43. Elisa Harris offered some statistics: "[A]nthrax is endemic to the soil in the Sverdlovsk region, 371 areas of which are considered permanently dangerous. Of these 371 areas, 48 have experienced between 2 and 4 anthrax recurrences. Between 1936 and 1968, there were 159 outbreaks of anthrax poisoning among animals as a result of this infected soil. Multiple cases of anthrax infection among humans have resulted from the slaughter and dressing of infected animals and from the consumption of contaminated meat. Although few of these cases have been written up in the scientific literature, one particular article describes five outbreaks in as many years, affecting between 5 and 40 people. Another contains information about three outbreaks involving between 3 and 11 people." Harris, "Sverdlovsk and Yellow Rain" (above, n. 24), p. 50.

⁴² "Sverdlovsk and the Biology of Anthrax," *F.A.S. Public Interest Report*, 41 (September 1988), 3.

⁴³ Christie, *Infectious Diseases* (above, n. 34), p. 767. Philip S. Brachman, "Anthrax," in *Communicable and Infectious Diseases*, ed. P. Wehrle and F. H. Top (St. Louis: C. V. Mosby, 1981), p. 121. In fact, the only reported article I could find in the non-Soviet medical literature on gastric anthrax was G. P. Jena, "Intestinal Anthrax in Man: A Case Report," *Cent. Afr. J. Med.*, 26 (December 1980), 253-254. Located in an undoubtedly obscure journal, this article details the case of a Zimbabwean male in a few paragraphs and provides the basic symptoms and prognosis. The paucity of literature on this topic is striking, yet for some unknown reason, almost every commentator on the topic cites pulmonary anthrax as rarer than the gastrointestinal variety. I could locate no medical sources to back up such an assumption.

Of course, Soviet health inspection codes required inspection for anthrax-infected meat, especially in high-risk areas like Sverdlovsk, but there were no control over or inspection of the significant trade in black-market meat. Since fresh meat was rare, it was quickly sold once it became available, which could explain the rapid spread of the outbreak. Because schools and barracks had their own commissary systems that procured fresh inspected meat, the failure to find children and soldiers among the casualties was explained. In addition, the Soviet legal system prosecuted those it held responsible for the outbreak. The disease outbreak was cited "in connection with the responsibility of private persons," specifically V. A. Starayev (who threw away an infected carcass in an unregistered area and sold 30 kilograms of meat to local residents) and M. I. Gorina (who killed an infected animal and then gave away the meat to relatives and friends). Both received very light sentences – Starayev paid a fine, and Gorina received a suspended one-year sentence – which struck several analysts as quite unusual, although it was in keeping with the standard veterinary laws, which is what Starayev and Gorina had been charged with violating.⁴⁴

Oddly enough, the Bezdenezhnykh and Nikiforov article does not even mention what would later evolve into the cornerstone of the "meat defense" – what I will call the "death-spread" argument (Figure 2). The incubation period for pulmonary anthrax – the difference between the inhalation of the microbes and the onset of disease – was estimated at about two to three days. If the outbreak were to be traced to an aerosol released from Military Post Number 19, then there should have been a huge peak of cases right away, which would then taper off to nothing within six days. The distribution of the numbers did not reflect such a curve. Even though the United States and the Soviet Union disagreed about how many died in the epidemic, both agreed that new cases continued to emerge for well over a month, which meant that either there were several explosions (which no one claimed) or there was a very small likelihood that the outbreak was pulmonary anthrax. The incubation period for gastric anthrax was not much longer (three to five days after ingestion), but the meat explanation fit the spread of data over the course of a month better because people could eat the meat, and thus begin incubation, over a longer period of time.⁴⁵ In fact, a graph of the data from the 1923 Yaroslavl outbreak looked like a "little Sverdlovsk."⁴⁶ American

⁴⁴ "Strogo Sobliudat' Veterinariye Pravila!" *Chelovek i Zakon*, 9 (September 1980), 70–72.

⁴⁵ This death-spread argument is made repeatedly in almost every discussion of Sverdlovsk. For a clear early exposition, see Medvedev, "Great Russian Germ War Fiasco" (above, n. 6), p. 361.

⁴⁶ Matthew Meselson, interview by author, 12 April 1993.

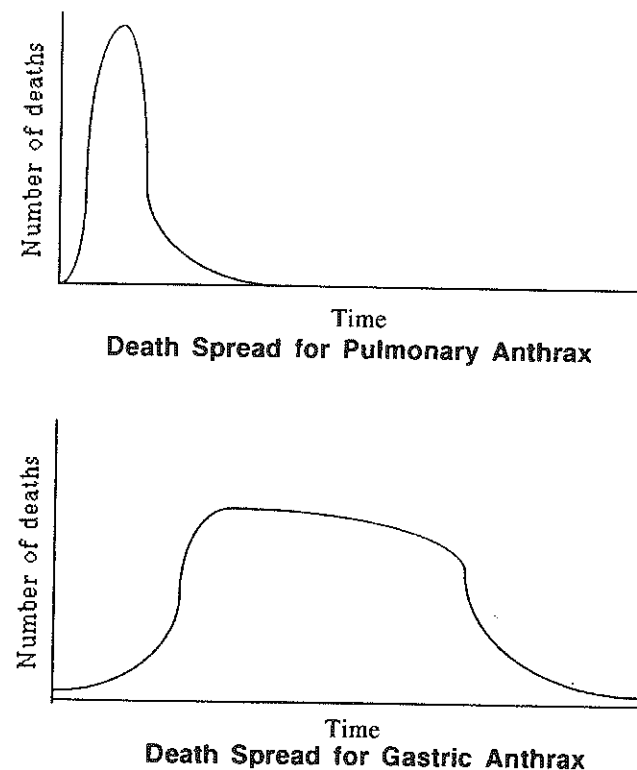


Figure 2. The "death-spread" argument. The upper graph shows the idealized death spread for an outbreak of pulmonary anthrax. There is only one sharp peak that culminates 2 to 3 days after the initial release of spores and then falls off dramatically. The lower graph shows the contrary case of a gastric anthrax outbreak: the deaths are spread out into a plateau instead of a spike.

scientists and government officials ventured several critiques, none of which were terribly successful.⁴⁷

Circumstantial evidence also pointed to Soviet innocence. Whereas many assumed that Sverdlovsk was a closed city, there was actually an American visitor there during the spring of 1979 – Northwestern University physics professor Donald E. Ellis. Even though he repeatedly passed by Military Post Number 19 while taking his children to a day camp during what the CIA reported as a period of extremely tight quarantine, he testified to seeing nothing out of the ordinary: "I don't exclude the possibility that something

⁴⁷ The most likely candidate was the "two-wave theory," in which an explosion would occur, generating a pulmonary peak. Then, as the pulmonary cases trailed off, the spores would infect animals and the gastric outbreak would follow. Gelb, "Keeping an Eye on Russia" (above, n. 21), p. 60.

may have occurred. But I think either I or my wife would have sensed some effort to protect us from it. We moved freely and were not aware of any restrictions on us." This for many was decisive, since clearly a military accident would have immediately forced Soviet authorities to place Ellis under close surveillance. Harvard's Matthew Meselson argued: "Although not conclusive, this does not readily fit in with the picture of an attempted Soviet cover-up of a biological-warfare accident."⁴⁸ In addition, in 1980, British reporter David Satter tried to sample locals' views of the event by riding the trans-Siberian railway through Sverdlovsk. He found nothing unusual; in fact, all the locals reported that they had heard the disease was spread by bad meat, which struck Satter as fairly convincing evidence that nothing suspicious had occurred.⁴⁹

Others argued that it was improbable that the Soviets would be developing anthrax as a weapon, since contemporary military thinking considered anthrax difficult to weaponize. One author cited one of the few empirical studies of pulmonary anthrax, taken from an outbreak in an American mill in 1957, which showed that the average employee inhaled between 600 and 2,150 viable spores a day and still did not contract the disease; it was a highly ineffective contaminant.⁵⁰ In addition, it was unlikely "that the Russians, with their experience of this scourge, would run the risk of playing around with anthrax near a vital military town," and would develop it instead in a distant suburb.⁵¹ Several analysts also proposed scenarios for a BW-linked outbreak that would not result in the violation of the BWC, diminishing the implications of the charges.⁵²

⁴⁸ Both Ellis and Meselson are quoted *ibid.*, p. 66.

⁴⁹ David Satter, "Support for Soviet Explanation of Anthrax," *Financial Times* (London), 10 June 1980, p. 2. Satter was only rarely cited as corroboration of the Soviet position. He recanted his 1980 position in 1991, claiming he was duped by KGB agents. David Satter, "Setting the Sverdlovsk Story Straight," *Wall Street Journal*, 18 April 1991, p. A16.

⁵⁰ Vivian Wyatt, "Anthrax: Recipe for a Blunt Weapon," *New Scientist*, 87 (4 September 1980), 722.

⁵¹ Vivian Wyatt, "Anthrax in the Air," *New Scientist*, 85 (27 March 1980), 986.

⁵² First of all, there was the exception clause in Article I of the BWC, which provides for peaceful and prophylactic research. Many have commented that even if the outbreak could be traced to the military outpost, there was a high likelihood that it had been working on only vaccines, and thus the accident was totally innocuous, as claimed by Philip Towle in "The Soviet Union and the Biological Weapons Convention," *Arms Control*, 3 (December 1982), 32-33. Second, there was a violation scenario concerning a missed stockpile, technically a violation of the BWC, although not in bad faith. It was possible that the Soviet Union had destroyed all of its biological stocks but had forgotten to eliminate one in Sverdlovsk, which then accidentally released spores. Such a situation had happened in the 1970s in the United States when a stockpile of shellfish toxin had been preserved in violation of Nixon's order. On this, see Raymond Zilinskas, "Anthrax in Sverdlovsk?" *Bull. Atom. Sci.*, 39 (June-July 1983), 25.

Of course, there was always the possibility that the allegations were only U.S. propaganda. This was the attitude taken by the Soviet Union, as heard on Radio Moscow on 9 July 1980: "One gets the impression that someone in Washington is feverishly looking for ways of artificially whipping up the psychological war against the Soviet Union after the boycott of the Moscow Olympics failed and the campaign over the events of Afghanistan began petering out."⁵³ Tass (the Soviet news service) also pointed out that outbreaks of foot-and-mouth disease happened in the West all the time, and a similar BWC "violation" could be deduced from these.⁵⁴

Despite attempts by the U.S. government to counter this many-leveled story, experts seemed to believe the Soviet version. Meselson serves as a good example. Granted clearance to look at a special CIA study of the Sverdlovsk events, and having heard the full brunt of the Soviet story, he commented: "I spent many hours looking at classified material. I disagree with the conclusion the [U.S.] government reached. That is all I am allowed to say."⁵⁵ The Sverdlovsk argument remained in this stalemate for five years, until the Soviets decided in 1986 to provide more information on the incident.

The year 1986 was a very fecund one in the history of East-West relations: just the year before, Mikhail Sergeyevich Gorbachev had assumed the portfolio of general secretary of the Communist Party, and in 1986 he initiated a series of reforms designed to rescue the Soviet system from internal collapse. The most-well known of these, perestroika and glasnost, did not reach full force until 1987, but 1986 saw the onset of a tremendous relaxation in U.S.-Soviet tensions, culminating in the Iceland summit of October 1986. This summit led to the renowned Intermediate-Range Nuclear Forces (INF) accords, the first full-scale arms-reduction effort since SALT. No one wanted to jeopardize the thawing of the Cold War by reviving a seven-year-old argument on an epidemic. The Second Review Conference of the BWC, which occurred in September 1986, directly on the eve of the Iceland summit, was seen as "one of the first opportunities for the Soviet Union to conduct its conference diplomacy in line with the 'new political thinking'."⁵⁶

⁵³ Quoted in James E. Oberg, *Uncovering Soviet Disasters* (New York: Random House, 1988), p. 15. This book places Sverdlovsk in the context of other Soviet disasters, such as Chernobyl.

⁵⁴ Sims, *Diplomacy of Biological Disarmament* (above, n. 7), p. 158.

⁵⁵ Quoted in Oberg, *Uncovering Soviet Disasters* (above, n. 53), p. 13.

⁵⁶ Nicholas Sims, "The Second Review Conference of the Biological Weapons Convention," in *Preventing a Biological Arms Race*, ed. Susan Wright (Cambridge, Mass.: MIT Press, 1990), p. 273. See also Barbara Hatch Rosenberg, "Updating the Biological Weapons Ban," *Bull. Atom. Sci.*, 43 (January/February 1987), 40. On the specific proposals undertaken during the rest of the Second Review Conference, see David Dickson, "Gene Splicing Dominates Review of Weapons Pact," *Science*, 234 (10 October 1986), 145.

That is exactly what the Soviets decided to do. The first thing that Ambassador Victor Issraelyan and his diplomatic contingent had to explain was the extended Soviet silence on the affair, which he attributed to Cold War tensions:

I am still confident that this whole story is a product of the cold war. Both the extreme suspicion of the US Administration about everything in the Soviet Union and the excessive secrecy and reserve of the Soviet society conspired to give birth to an ugly phenomenon in the history of international relations – the Sverdlovsk incident. I am quite sure that if the information which has been provided by Soviet experts in recent years had been published immediately after the anthrax outbreak, or at least in response to US appeals in 1980, many of the still unanswered questions would not have been asked.⁵⁷

Those questions had already been asked, however, and after the Soviets had given the green light to further question about Sverdlovsk, a particular Western scientist began to gather as much information as possible. That scientist was, as might be expected, Matthew Meselson. In 1986 he visited the Soviet Union to amass data on the epidemic, which he hypothesized to be of natural origin, and to invite Soviet scientists to come to the United States to present their position. The story that follows is a composite of his findings in the Soviet Union and the statements of the three Soviet scientists who visited the National Academy of Sciences (NAS) in April 1988; Pyotr Burgasov, retired deputy minister of health; Vladimir Nikiforov, chief of infectious diseases at the Moscow Institute of Advanced Training of Physicians; and Vladimir Sergeev, director of the Institute of Parasitology and Tropical Medicine (and had been Burgasov's private secretary in 1979).

According to Nikiforov, the first cases of anthrax were three fishermen who died the weekend of 7 April 1979. Nikiforov gave a tentative diagnosis of anthrax after examining the bodies and began to set up a contained hospital. Bacteriological tests confirmed his diagnosis, and patients flooded into the special ward as the epidemic grew.⁵⁸ After tests had isolated anthrax in meat from the homes of all the patients, the authorities began to look for the source of the contaminated meat. The name of the culprit was Aramil: a factory 15 kilometers southeast of Sverdlovsk, which was reported to have ground up a 29-ton lot of bone meal made from the carcasses of infected animals. Bone

⁵⁷ Victor Issraelyan, "Possible Implications of the Anthrax Outbreak in Sverdlovsk on Future Verification of the Biological Weapons Convention: A Soviet Perspective," in *Views on Possible Verification Measures for the Biological Weapons Convention*, ed. S. J. Lundin (Oxford: Oxford University Press, 1991), p. 122.

⁵⁸ Eliot Marshall, "Sverdlovsk: Anthrax Capital?" *Science*, 240 (22 April 1988), 384.

meal was "slaughterhouse waste and grain ground up and dry autoclaved," and it was both high in protein and cheap to make when food supplies were low (and even when they were not).⁵⁹ There was a direct correlation found between this bone meal and anthrax: where the bone meal was absent, there were no epizootics.⁶⁰ When this infected feed was given to cattle, they all contracted anthrax and the epidemic began.⁶¹

There was nothing terribly unusual about using bone meal during a food shortage; 1979 was not the first harsh winter that Sverdlovsk had seen, and there were strict regulations on bone meal production that should have prevented any contaminated waste from entering the feed. The autoclaving process was supposed to grind the meal at high temperatures to kill stray microbes. What went wrong? According to Meselson, anthrax bacilli survived due to a host of safety violations at Aramil: "Autoclave pressure readings were not taken, records of sterilization times were not kept, the raw material and the autoclaved material were handled in the same area and transported in the same wheelbarrows, and microbiological analysis was not carried out."⁶²

There was still the looming question of the scope of the epidemic – the numbers ranged well into the thousands on the Western side of the story. The final breakdown was much more modest, with 96 individuals diagnosed with anthrax, of whom 64 died. Many of those who did not die were diagnosed with cutaneous anthrax, which was easily cured. Therapy failed for most gastrointestinal cases. The first patients came in on 4 April; the number of patients per day until 19 April was 5, 5, 5, 7, 7, 6, 10, 8, 7, 5, 4, 4, 1, 0, 0, and 1 (Figure 3). After that there were twenty additional hospitalized cases, although no two were committed on the same day.⁶³ Except for one six-year-old (who had contracted cutaneous anthrax), all of those diagnosed with anthrax were adults, and more than two-thirds of those were men. Of those hospitalized through 19 April, one was under 20 years of age; 11 between 21 and 29; 10 between 30 and 39; 32 between 40 and 49; 10 between 50 and 59; and 23 over age 59. There was a definite bias toward older individuals.⁶⁴ The Soviets claimed that when supplies were scarce, Soviet families traditionally

⁵⁹ Matthew Meselson, "Discussions in Moscow Regarding Sverdlovsk Anthrax Outbreak," 25 September 1986, p. 3. Matthew Meselson Papers (hereinafter cited as MMP).

⁶⁰ I. S. Bezdenejnyh, P. N. Burgasov, and V. N. Nikiforov, "Epidemiological Analysis of Anthrax Outbreak in Sverdlovsk" [1986], p. 5, MMP.

⁶¹ Marshall, "Sverdlovsk: Anthrax Capital?" (above, n. 58), 384. Meselson, "Discussions in Moscow" (above, n. 59), p. 5.

⁶² Matthew Meselson, "The Biological Weapons Convention and the Sverdlovsk Anthrax Outbreak of 1979," *F.A.S. Public Interest Report*, 41 (September 1988), 5. For a more detailed account, see Bezdenejnyh et al., "Epidemiological Analysis" (above, n. 60), p. 5.

⁶³ Meselson, "Biological Weapons Convention" (above, n. 62), p. 4.

⁶⁴ Meselson, "Discussions in Moscow" (above, n. 59), p. 4.

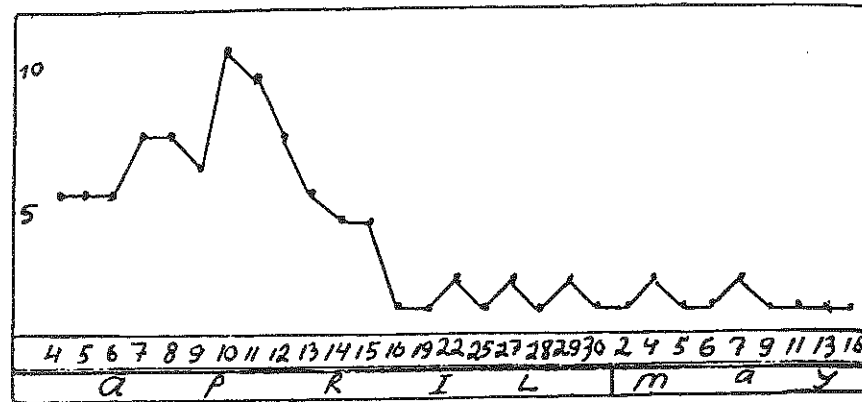


Figure 3. Soviet data on number and spread of deaths, from a memorandum given to Meselson during his 1986 visit to the Soviet Union. (From I. S. Bezdenejnh, P. N. Burgasov, and V. N. Nikiforov, "Epidemiological Analysis of Anthrax Outbreak in Sverdlovsk" [1986], p. 7, Matthew Meselson Papers.)

served meat only to the head of the household, the major wage earner. In most Soviet households that was usually a middle-aged man, which explained the distribution of cases. The proximity of the May Day holidays induced some citizens to preserve their meat for some time after purchase, explaining the spread of deaths over time.⁶⁵

These are only civilian statistics, but according to U.S. intelligence data, both human and satellite, the military was also involved. The Soviets had consistently denied the presence of military casualties, but how were they to explain this in the face of a citywide epidemic? Burgasov, Nikiforov, and Sergeyev admitted officially for the first time that there was even a military installation in the town, although they still denied any connection between it and the epidemic.⁶⁶ The reported omnipresence of the military during the reported quarantine and disinfection efforts was not necessarily sinister. Journalist James Oberg later defended the presence of the Soviet military:

At the Chernobyl nuclear plant accident in 1986, for example, specialized Soviet army decontamination units had been put in charge immediately despite the civil nature of the catastrophe. This was because they were the only agency with the appropriate equipment, training, and disciplined organizational structure. By analogy, the appearance of Soviet anti-germ-warfare specialists in a civilian anthrax epidemic that had gotten out of hand would not really have been proof of the epidemic's military origin.

⁶⁵ Bezdenejnh et al., "Epidemiological Analysis" (above, n. 60), p. 7.

⁶⁶ Joseph Palca, "Anthrax Outbreak in Soviet Union Due to Natural Causes?" *Nature*, 332/6164 (21 April 1988), 674.

Again, the army would have had the best-trained people and equipment for the emergency.⁶⁷

The nature of this public cleanup effort also leaned toward gastric anthrax. Public decontamination affected only buildings related to meat production: "About 30 buildings where possibly infected animals were slaughtered and butchered were burned. . . . Refrigerators and certain other surfaces suspected of contamination were disinfected with chloramine."⁶⁸ Publicly posted flyers also pointed to a gastric origin, cautioning against undercooked meat and leftover supplies not obtained through official channels, and ordering the destruction of stray dogs.⁶⁹

In principle, there was nothing new about these revelations which were mostly elaborations on old data already known to the U.S. government. The major break with the pre-1986 Sverdlovsk story was the introduction of medical data to supplement the claims of gastric anthrax. When the three Soviet scientists arrived at the NAS in Washington in 1988, they brought with them something that no one in the West had ever seen before: slides of organ cross-sections and gross organs reportedly taken from victims of the epidemic. Most were stomach cross-sections, showing the point of entry and spread of the anthrax bacteria. David Huxsoll, commander of the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID at Fort Detrick), said that "the slides showed intestinal anthrax, but whether they are from victims of the Sverdlovsk event is unknown."⁷⁰ Many other nongovernmental scientists present felt no need to doubt the slides. In addition, Meselson reported upon his return from the Soviet Union in 1986 that in all cases "the inner surface of the lungs was undamaged and free of hemorrhage."⁷¹ It is not exactly clear where Meselson obtained this information, but it appears that he was given slides to examine by these Soviet academicians, of which he took one with him back to the U.S. Regardless of where the slides came from, by the end of the meeting, most of the other outstanding circumstantial evidence for a military accident had been explained away as due to a public health disaster.⁷²

⁶⁷ Oberg, *Uncovering Soviet Disasters* (above, n. 53), pp. 18–19.

⁶⁸ Meselson, "Discussions in Moscow" (above, n. 59), p. 4.

⁶⁹ For an original flyer and corresponding translation, see Meselson, "Biological Weapons Convention" (above, n. 61), p. 5.

⁷⁰ Lois Ember, "Soviet Anthrax Dispute: Details of 1979 Outbreak Presented," *Chem. Eng. News*, 66 (18 April 1988), 4.

⁷¹ Meselson, "Discussions in Moscow" (above, n. 59), p. 6.

⁷² Even the flood of victims to hospitals reported in almost every Western intelligence report was likely the product of rational public health measures. When the Soviet authorities realized that the anthrax was spreading, they required that everyone with a fever or any of the other early symptoms of gastric anthrax (stomach aches, chest pains, etc.) come to a hospital for

When the Sverdlovsk situation stalemated in 1981, there were three specific arguments the U.S. government had to contend with: the testimony of Donald Ellis, who had been present in Sverdlovsk and saw nothing unusual; the presence of gastric anthrax instead of pulmonary anthrax; and the death-spread argument. The Soviet meat explanation adequately solved the last two of these problems, but it was also left with the difficulty of explaining Ellis. If there were a large-scale mobilization of the public-health apparatus, how could one explain Ellis's testimony of normal, everyday life? This had been the same piece of evidence that Meselson originally found so convincing and that led him to publicly doubt the government's case. It was resolved in a manner similar to the case of Hmong testimony in the Yellow Rain episode mentioned earlier: there was no way to explain it away, so the fact was "black-boxed" and ignored by mutual consensus.⁷³ Everyone agreed that Ellis's observations were anomalous, so they were silently disregarded, as noted by one journalist: "For the new 'official' Soviet explanation in 1986, Ellis's testimony of 'life as usual' is no longer the corroboration Meselson presents it as. Indeed, it *must be dismissed* as unconnected with the reality of Sverdlovsk's April 1979 epidemic; the reasons are *indeterminable*."⁷⁴ Since there was no explanatory framework that would accommodate Ellis's matter of fact, it ceased to be one at all.

It seemed that the overwhelming conclusion of those scientists and analysts who looked into the matter after the new Soviet revelations was that the meat explanation was correct. The U.S. government continued to argue (somewhat half-heartedly) in favor of its previous position, but the crew of dissenters grew daily. Meselson especially threw his substantial influence behind the Soviet account:

Contrary to the US government version of the event, there was no evidence of inhalatory anthrax. All epidemiological, clinical, and patho-anatomical evidence supported the diagnosis of intestinal and cutaneous anthrax. Also contrary to the US version, there were no anthrax cases among military personnel, military medical personnel never took over from civilians at hospital number 40, and there was no aerial spraying of disinfectant. . . . It

examination. The high proportion of flu cases in late winter sparked the dramatic initial rush to hospitals and the thousands of "victims" in the Western allegations. Ember, "Soviet Anthrax Dispute" (above, n. 70), pp. 4-5.

⁷³ This argument is presented in my unpublished manuscript "Yellow Rainstorm" (above, n. 2).

⁷⁴ Oberg, *Uncovering Soviet Disasters* (above, n. 53), p. 21 (emphasis added). I attempted to contact Donald Ellis to find out his current position on what happened in 1979 or how he feels about this dismissal of his testimony. He refused to comment.

is already clear that the US version of the Sverdlovsk anthrax outbreak is in need of a careful and objective review.⁷⁵

An anonymous American scientist put it more cautiously. While he found the meat story "completely plausible," on evidential grounds, "[a]s to whether it is true or not is something our government will have to satisfy itself on."⁷⁶

Red Journalism

There was still one set of people who were not satisfied with the Soviet view: journalists, both American and Soviet. Starting in late 1987, Gorbachev lifted a great many restrictions on the Soviet press, and by 1989, the press had become almost the functional equivalent of a Western free press. There were, however, still certain limitations. What was almost unrestricted as a topic of investigation was the fascinating and unknown (to the Soviet people) history of the Soviet period, especially the stagnancy of the Brezhnev years. It was this topic that led some journalists to reexamine the 1979 outbreak at Sverdlovsk. While there was wide consensus in the West about the validity of the meat defense, sporadic articles began to appear in the Soviet press that challenged the Soviet account, articles offering interpretations of that fateful month that strongly resembled the original American allegations from 1980.

A local Sverdlovsk paper, *Uralskiy Rabochiy*, published the first of these articles on 12 March 1990. It was not particularly deep, but it did make the connection between the military facility in Sverdlovsk and the deaths, reiterating American doubts about the nature of the public health measures taken and their consistency with the meat story.⁷⁷ It was not much, but it prepared the way for greater waves that would soon crash on the self-contained meat defense.

The first of these tsunamis – enormous in the amount of attention it generated in the West – was an article by a native of Sverdlovsk, Natalya Zenova, published on 22 August 1990 in *Literaturnaya Gazeta*, one of the most widely read and respected Soviet newspapers. Not only did the article make the same claim the Americans made, it provided new evidence, mostly interviews with doctors, to support it. These doctors were not the Burgasovs of high-level BW diplomacy; they were the doctors in Hospital No. 40 who had treated those diagnosed with anthrax. Their statements are all of a piece: "There can be no

⁷⁵ Meselson, "Biological Weapons Convention" (above, n. 61), p. 6.

⁷⁶ "Biological Weapons: Debate on Anthrax Incident Flares," *Chem. Eng. News*, 65 (6 April 1987), 4-5.

⁷⁷ As summarized in Milton Leitenberg, "A Return to Sverdlovsk: Allegations of Soviet Activities Related to Biological Weapons," *Arms Control*, 12 (September 1991), 168-169.

doubt – what we had was waste from a bacteriological weapon. . . . Everyone prefers to remain silent concerning bacteriological weapons. It is indecent to talk about this in decent society.” The article also questioned the roots of the meat defense: “Why, if it was ‘simply’ anthrax in Sverdlovsk, did people in military uniform play first violin in the investigation of facts? Why was the whole story of the illness eliminated along with all records and all documentation from ‘concerned’ institutions?”⁷⁸ Zenova found families of victims in possession of death certificates registering “bacterial pneumonia,” pointing to a pulmonary disease, which the KGB had tried to confiscate. The shock waves started by this article began to radiate outward from Sverdlovsk.

Zenova continued her article with a sequel on 2 October 1991 in the same newspaper, defending her original argument in the face of criticism leveled at her in a letter from Meselson. This article was more structured and proof-oriented than the emotional first piece. Zenova reinterviewed many of the doctors mentioned in the first article, finding that “not one doctor mentioned pains in the stomach, let alone sharp ones. Instead everyone, like a single person, painted a picture of the heaviest pneumonia. . . .”⁷⁹ All of the documents that survived an apparent KGB cover-up pointed to heavy wounding of the pulmonary system in every patient. Finally, there was an interview with Boris Martyanov, the director of the Aramil plant (which is not completely true, Meselson avers). He denied all involvement, saying Aramil was a consumer of bone meal, not a producer. Aramil did not even have the autoclaves that the Soviets and Meselson blamed for the diseased fodder.⁸⁰ The entire story seemed to be a sham.

The journalistic excitement spread to the *Wall Street Journal* in New York City, which also began to investigate these stirrings on the Sverdlovsk issue. After being publicly humiliated by Meselson for their support of the U.S. government in the Yellow Rain affair, these reporters seized on an opportunity to justify their original claims of Soviet perfidy – and to embarrass Meselson in the process. The *Journal* published a series of three articles by Peter Gumbel retracing Zenova’s trail in Sverdlovsk. In a deliberate attack on Meselson, Gumbel exposed Meselson’s incorrect claims about the failure of Aramil procedures: “In fact, there is no meat processing plant in Aramil . . . there is no slaughterhouse of any kind in the plant, or anywhere in the area.” Martyanov again vehemently denied the charges: “We never produced bone meal. We get it ready-made from a Sverdlovsk slaughterhouse or elsewhere. . . . We

⁷⁸ Natalya Zenova, “Voyennaya Tayna,” *Literaturnaya Gazeta*, 22 August 1990, p. 12. The English translation is taken from the reprint “The Deadly Cloud Over Sverdlovsk,” *Wall Street Journal*, 28 November 1990, p. A22.

⁷⁹ Natalya Zenova, “Voyennaya Tayna, Chast’ II,” *Literaturnaya Gazeta*, 2 October 1991, p. 6.

⁸⁰ *Ibid.*

don’t have and never did have the production [facilities] that would enable us to make bone meal or any other feed from livestock. . . . In 1979, we never sold mixed feed to private individuals. Our only customers were state organizations.”⁸¹ The chief veterinarian of Sverdlovsk, who would most likely know about an epizootic in the district, claimed to be extremely skeptical of the government’s explanation.

Gumbel continued his story in the next article of the trilogy, this time exploring Zenova’s claims that the anthrax may have been pulmonary. It had become apparent, through the testimony of many victims’ families, that the KGB had been very earnest about collecting all of the death certificates implicating pneumonia. The most significant revelation, however, was that two doctors, Lev Grinberg and Faina Abramova, had kept their original materials, both documentary and biomedical, on the nature of the epidemic. These seemed to indicate that the epidemic had a pulmonary origin.⁸²

This call from the West for reappraisal was echoed from the Soviet Union, as others joined Zenova in investigating the Sverdlovsk affair.⁸³ But arguably the most important piece of new evidence came not from journalists but from one of the highest officials in the Soviet hierarchy: Boris Yeltsin, then (and still) president of the Russian Republic. In April 1979, Yeltsin had been party secretary of the Sverdlovsk district, and therefore was in theory accountable for the outbreak. As Yeltsin told *Kuranty*, the daily paper of the Moscow City Council, on 1 November 1990:

I knew about the existence at this post of a closed research center but I had no information about what it was doing specifically, although I could guess. . . . After the beginning of the epidemic, I appealed to the Ministry of Defence with a personal request that it look into the involvement of this centre in what happened and that it remove research laboratories endangering the lives of hundreds of thousands of citizens of Sverdlovsk beyond the borders of the city. A large group of military and KGB people arrived. They did not inform me personally of the results of their work, although with the passage of time some of the laboratories were removed beyond the boundaries of the military post.⁸⁴

⁸¹ Peter Gumbel, “The Anthrax Mystery,” *Wall Street Journal*, 21 October 1991, p. A18.

⁸² Peter Gumbel, “Death in the Air,” *Wall Street Journal*, 22 October 1991, p. A20.

⁸³ For example, V. Chelikov’s article in late 1991, on the very verge of the Soviet Union’s collapse, openly claimed that the work at Military Post Number 19 was for offensive bacteriological agents, and called for a rejection of the meat theory in favor of an aerosol rendition. V. Chelikov, “Chuma na sosedney ulitse,” *Komsomol’skaya Pravda*, 20 November 1991, p. 4. See also the summary of *Znanya Yunosti* article on 24–25 October 1990, in Leitenberg, “A Return to Sverdlovsk” (above, n. 77), pp. 170–172.

⁸⁴ As quoted in Leitenberg, “Return to Sverdlovsk” (above, n. 77), pp. 172–173.

Here at least was an admission from on high that the KGB and the military had been involved, despite previous assurances to the contrary, and that the region's Communist Party secretary had been left in the dark.

The final Gumbel article focused on the KGB and military involvement in the epidemics, especially in areas unrelated to the cleanup, such as the confiscation of laboratory samples and International Red Cross documents.⁸⁵ If the epidemic really had been a result of meat, Gumbel argued, then the Soviets would have punished those responsible more severely with a substantial prison term. Those they did punish, however, as we saw earlier, were let off with a slap on the wrist, and it was now clear that the crimes they were accused of committing were supposedly committed *after* the initial anthrax-related deaths had occurred. A conjecture in a later Soviet article stated that the aerosol of spores was due to a failure of an anonymous technician at the military facility to close a valve to the outside, enabling a small, accidental burst of spores to escape the room through a small shaft and contaminate the city.⁸⁶

The same article went on to make a more definite charge: supposedly, Burgasov revealed in an interview that the 1988 NAS visit by the three Soviet physicians may have been deliberately deceptive.⁸⁷ Now there was an explanation for the failure of these new data to correlate with the slides and figures presented in Washington: the interviews were real, and the science was fabricated. The change in the political atmosphere had likewise changed the standards of credible evidence. Gumbel reports Nikiforov as ignoring data that did not fit the meat theory: "It's just selective data," Dr. Lev Grinberg said about Nikiforov's articles and the NAS report.⁸⁸ At last, the *Wall Street Journal* had a mallet with which to smash Matthew Meselson, the one who had brought these charlatans to the United States and had bought their story, hook, line, and sinker. They did not waste any time recalling the analogy to Yellow Rain:

Writers for the *Literaturnaya Gazeta* and the *Wall Street Journal* are only journalists, of course, Professor Meselson and his allies also say that "science" has proved that bee droppings explain the "yellow rain" Hmong tribesmen said killed their compatriots in Laos. It is always possible for

⁸⁵ Peter Gumbel, "Anthrax: The Survivors Speak," *Wall Street Journal*, 23 October 1991, p. A14.

⁸⁶ A. Pashkov, "'Ya znayu, otkuda poyavilas' sibirskaya yazva v Sverdlovsk," *Izvestiya*, 23 November 1991, p. 4.

⁸⁷ Ibid.

⁸⁸ Zenova, "Voyennaya Tayna, Chast' II" (above, n. 79), p. 6.; and Gumbel, "Death in the Air" (above, n. 82), p. A20.

journalists to sensationalize. But is also possible that Soviet scientists could lie to the NAS. . . .⁸⁹

The Refereed Journal: Making the Story True

These revelations by journalists were not coming to light in a vacuum. Although journalism had argued that the U.S. government had been right all along and the Sverdlovsk incident was due to military BW research, the press had made similar sensationalistic claims with respect to the Yellow Rain allegations, blowing that affair out of proportion. As a consequence, it would take more than a few articles in the press to transform the well-established expert conclusion that the BWC had not been violated at Sverdlovsk. In particular, Matthew Meselson had spent a great deal of time and effort to get the Soviets to reveal medical data supporting the meat defense; his opponents, on the other hand, had no proof other than personal testimony, and the Hmong testimony of Yellow Rain affair had taught everyone how unreliable that could be. There needed to be more proof, a higher standard by which everything could be evaluated. The standard was proof in a referred scientific journal: Meselson's standard for Yellow Rain.⁹⁰

There were two remaining arguments against BW as a cause of the Sverdlovsk incident (after the dismissal of Ellis) that needed to be removed: the evidence that the infection was gastric and the death-spread data. One of the arguments that had originally made the meat defense so persuasive was that Western doctors had never seen a case of gastric anthrax, and thus were in no position to criticize the claims made by the Soviets. This argument was actually turned around by a small cadre of biologists and used *against* the meat defense. Gastric anthrax was so rare, even in the Soviet Union, that few Soviet doctors had even seen a case. Most of the reported

⁸⁹ "Scientific Fraud?" *Wall Street Journal*, 28 November 1990, p. A22.

⁹⁰ There is a significant discrepancy in the weight given to laboratory science as published in scientific journals and forensic science data, such as that presented in the courtroom. In both Yellow Rain and Sverdlovsk, the government's cases were built on forensic evidence, while Meselson critiqued them as not having the same level of certainty as a laboratory experiment. This disregard for forensic evidence has been documented (albeit sparsely) in the courtroom context. See Sheila Jasanoff, *Science at the Bar* (Cambridge, Mass.: Harvard University Press, 1995), chap. 3; and Roger Smith, "Forensic Pathology, Scientific Expertise, and the Criminal Law," in *Expert Evidence*, ed. R. Smith and B. Wynne (London: Routledge, 1989), pp. 56-92. The lack of professional respect for forensic scientists by laboratory scientists is paralleled by the status of forensic pathologists vis-à-vis clinical pathologists. See Julie Johnson, "Coroners, Corruption, and the Politics of Death," in *Legal Medicine in History*, ed. M. Clark and C. Crawford (Cambridge: Cambridge University Press, 1991), pp. 268-289. I would like to thank Julie Johnson-McGrath for her assistance on this point.

cases were localized in small villages in central Africa, where autopsies and diagnostic clinical data were limited. It was not until cultures came back from the laboratory in April 1979 that Soviet doctors even knew that they were dealing with anthrax, as Lev Grinberg attested.⁹¹ The lack of clinical data made it impossible to take the word of clinicians alone on the gastric nature of the epidemic. The standard of proof was raised: pedigreed physical samples were necessary. Testimony of patients' stomach pains reported by doctors was no longer proof; there had to be slides of stomach cross-sections, slides whose origin was more certifiable than those Burgasov handed to the NAS in 1988.

Amazingly enough, such samples did exist. Lev Grinberg and Faina Abramova, who were working as doctors in Sverdlovsk during the epidemic, had initiated an investigation into its origins. They gathered testimony, took anthrax samples, and kept cross-sections of stomach and lung – correctly preserved – in their office. The samples were dated and catalogued, and they had miraculously survived the KGB's inspection of Abramova's office.⁹² These samples from 42 victims of the epidemic were finally brought into the scientific world and would soon become the lever that turned the world. The well-documented slides of lung tissue showed the full development of anthrax lesions in the lungs, indicating primary infection through pulmonary pathways: "The pulmonary portal of entry was further emphasized by the presence of a primary anthrax pulmonary focus – i.e., focal hemorrhagic, necrotizing anthrax pneumonia in 11 patients."⁹³ The slides reproduced in the Abramova article – in a scientific journal – expanded the circle of belief. Those gastric lesions that existed were secondary; the standard Russian pathology text by Davidovsky pointed out that 90 percent of gastric lesions result from inhalational or cutaneous entry. The conclusion was explicit for the first time in a journal: "The availability of these new data leads to the conclusion that these patients died because of inhalation of aerosols containing *B. anthracis*."⁹⁴

There were still items that could not be explained by this new evidence, even though the slides were extraordinarily conclusive. For example, children did not, for the most part, contract anthrax from the hypothesized aerosol, even though they spent a large portion of their time outdoors. This point remained "unexplained" in the articles putting forth the pulmonary proof, even though the meat version had a handy explanation of this phenomenon

⁹¹ David Walker, Olga Yampolska, and Lev Grinberg, "Death at Sverdlovsk: What Have We Learned?" *Amer. J. Pathol.*, 144 (June 1994), 1136.

⁹² *Ibid.*

⁹³ Faina Abramova, Lev Grinberg, Olga Yampolskaya, and David Walker, "Pathology of Inhalational Anthrax in 42 Cases from the Sverdlovsk Outbreak of 1979," *Proc. Nat. Acad. Sci., USA*, 90 (March 1993), 2291.

⁹⁴ *Ibid.*, p. 2294.

(the independent commissary system in schools).⁹⁵ Again, as we saw earlier, when there were items of evidence better explained by the opposing theory, the more important "matter of fact" determined the choice of conceptual framework. What occurred here was not so much a dismissal of evidence as a reevaluation of what items were more or less important (in this case the slides of pulmonary lesions). These distinctions were forged directly in the hearth of the political debate. There was no perfect explanations of all the data; "best fit" seemed to be the order of the day.

More immediately, there was a need to explain the death spread. Even if the slides came from individuals who died of pulmonary anthrax in 1979, there had to be a reason that the deaths were distributed over a monthlong period. Here Meselson, who was active in bringing out the new data of Abramova and Grinberg, made his salient contribution: the rejection of another established concept. Given the disparity between Abramova's slides (which were clear) and the death-spread argument (also clear, but statistical and not visual), it was not possible simply to write one of them off. An explanation had to be found by rejecting what had been one of the foundations of the entire Sverdlovsk debate: the incubation period of anthrax.

It had been taken to be well established that the incubation period of pulmonary anthrax was two to three days, a fact that made a poor fit with the actual spread of cases at Sverdlovsk. Meselson found, however, by searching the literature on inhalation anthrax, that this fact was far from secure. An extended incubation period was equally possible, allowing spore germination a full 30 days after exposure. By reopening the debate around a matter of fact, the death-spread argument was brought into agreement with the slides. No new experiments were conducted or models proposed. Meselson's attention was simply drawn to an article in a little-known medical journal that demonstrated an incubation period of up to 90 days before inhaled spores would germinate; once those spores germinated, however, the average onset of full-blown anthrax was still 2–3 days. But the data that had established the previous 2–3 day rate were invariably taken at high dosage, and the possibility that incubation time could vary with dosage was never considered. The newly uncovered (but old) collection of articles all pointed to this direct relation of dosage to incubation rate.⁹⁶ The new calculations were seen to have two

⁹⁵ Walker et al., "Death at Sverdlovsk" (above, n. 91), p. 1138.

⁹⁶ There is a sizable but finite collection of older medical articles that were used to establish the variability of the pulmonary anthrax incubation period. Crucial in this collection are D. W. Henderson, S. Peacock, and F. C. Belton, "Observations on the Prophylaxis of Experimental Pulmonary Anthrax in the Monkey," *J. Hyg.*, 54 (1956), 28–36; Philip S. Brachman, Stanley A. Plotkin, Forrest H. Bumford, and Mary M. Atchison, "An Epidemic of Inhalation Anthrax: The First in the Twentieth Century," *Amer. J. Hyg.*, 72 (July 1960), 6–23; Charles M. Dahlgren, Lee M. Buchanan, Herbert M. Decker, Samuel W. Freed, Charles R. Phillips, and Philip S.

separate dosage curves: "The survival range for the lower dosage group was 3–20 days (mean 7.5 days); for the higher, 2–5 days (mean 3 days)."⁹⁷ The death-spread argument was no longer set in stone.

It was only a matter of time before the whole synthesis was compiled and presented in a referred scientific journal, closing the affair permanently. The article finally appeared in November 1994 in *Science*, under Meselson's pen. This was the first (and as of this writing, the only) attempt to consolidate all the information revealed about Sverdlovsk since 1988 and organize it into an argument rejecting the meat defense. Meselson did not seek to support the entirety of the American charges – he wanted only to show the unnatural nature of the outbreak. The source site of the anthrax, its potential uses, and hence the implications for the BWC were not addressed.

The research for the article was amassed from a series of visits by Meselson to Sverdlovsk in June 1992 and in August 1993.⁹⁸ In the article, Meselson and his coauthors began by stressing the involvement of the KGB in the cover-up of the affair, implying that previous interpretations of the data were based on false data and therefore exonerating those who previously advocated them, such as Meselson. The epidemiological data of the NAS visit, such as the distribution of patients, their age groups, and the various public health measures taken by the Chkalovskiy regional authorities, were reviewed and verified. And finally, the probable daytime geographical location of all the victims of anthrax was taken for the dates in question, locating just about all of the victims to one sector of the city at the beginning of April 1979.⁹⁹ Similarly, if one traced the livestock deaths due to anthrax during April and May 1979, one found that they lay in an elongated ellipse wedge with the apex north of the Chkalovskiy region (very close to the Military Post), spreading wider as one traveled south. The compass reading of this wedge at the farthest point is

Brachman, "Bacillus Anthracis Aerosols in Goat Hair Processing Mills," *Amer. J. Hyg.*, 72 (July 1960), 24–31; and Harold N. Glassman, "Discussion," *Bacter. Rev.*, 30 (September 1966), 657–659.

⁹⁷ C. A. Gleiser, C. C. Berdjis, H. A. Hartman, and W. S. Gochenour, "Pathology of Experimental Respiratory Anthrax in *Macaca Mulatta*," *Brit. J. Exp. Pathol.*, 44 (June 1963), 418. This is the original article that was shown to Meselson.

⁹⁸ Most of the data came from interviews with Sverdlovsk residents and the families of the deceased. Matthew Meselson, Jeanne Guillemin, Martin Hugh-Jones, Alexander Langmuir, Ilona Popova, Alexis Shelokov, and Olga Yampolskaya, "The Sverdlovsk Anthrax Outbreak of 1979," *Science*, 266 (18 November 1994), 1203.

⁹⁹ Meselson and his colleagues were able to determine that of the 77 tabulated patients (on 66 of whom they had data), 57 lived and worked in the Chkalovskiy region. Of the remaining 9, 6 had jobs (such as truck driver) that could easily have taken them through that area, and 5 of those had attended military reserve training in the area during the early part of April. That left 3 whose connection to the district was unexplained: one was temporarily working south of the military plant, one was on vacation, and so could have been in the area, and there was inadequate information on the last. *Ibid.*, pp. 1205–1206.

$330^{\circ} \pm 10^{\circ}$. Now all that was needed was a mechanism that could infect only those people and cattle who were in one sector stationed south of Military Post Number 19: an aerosol. The primary source of wind-speed readings in the area of Sverdlovsk is from Koltsovo airport, located 10 kilometers east of Sverdlovsk. The compass reading required for an aerosol to head parallel to the wedge was a very rare wind direction, accounting for less than 2 percent of all measured currents. It occurred during Monday, 2 April (Figure 4).¹⁰⁰ Here was the crucial piece of the puzzle: "Accepting 2 April as the only date of inhalatory exposure, the longest incubation period for fatal cases was 43 days and the modal incubation period was 9 to 10 days. This is longer than the incubation period of 2 to 6 days that has been estimated from very limited data for humans."¹⁰¹ The revision of this data into an aerosol explanation was a coup.

Conclusion: Rethinking Verification

The most notable element of the conclusion of this affair, in contrast to Yellow Rain, was that Meselson was here arguing *for* a BW incident. For the confirmed realist, this is nothing unusual: it happened to be the case that there were BW agents in the air in Sverdlovsk and not in Laos. But the story is more complicated than that. In another paper, I argued that while Meselson was certainly seeking the truth of the allegations, his initial hypothesis was aimed toward exonerating the Soviets in order to preserve the inviolate status of the BWC.¹⁰² Although this analysis does help explain his hostility to the Sverdlovsk charges until 1994, it clearly fails with the 1994 article. Here Meselson was not trying to preserve the status of the BWC. Although he did not argue for a violation of the BWC, he certainly demonstrated that such an incident might have happened. What prompted this change of mind?

It would be helpful to step back here and examine the greater context of international treaty politics. The initial discussions of the Yellow Rain affair constantly raised the question of whether it was possible to trust the Soviets on arms-control issues. But while Yellow Rain captured the public imagination on CBW arms control, Sverdlovsk was considered more crucial for the integrity of the BWC and for the CWC negotiations by the diplomatic community because it directly exposed many of the inadequacies of treaty protocols concerning verification investigations. Since the BWC was built completely on a foundation of trust, Sverdlovsk and other possible violations

¹⁰⁰ *Ibid.*, p. 1206.

¹⁰¹ *Ibid.*, p. 1207.

¹⁰² Gordin, "The Yellow Rainstorm," unpublished manuscript.

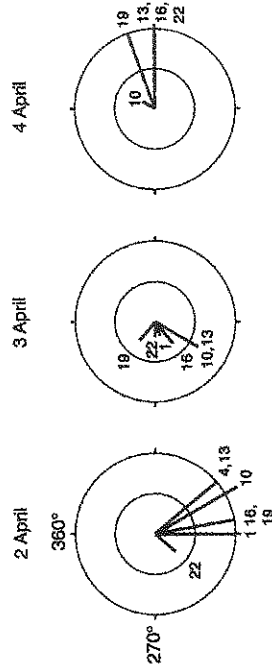
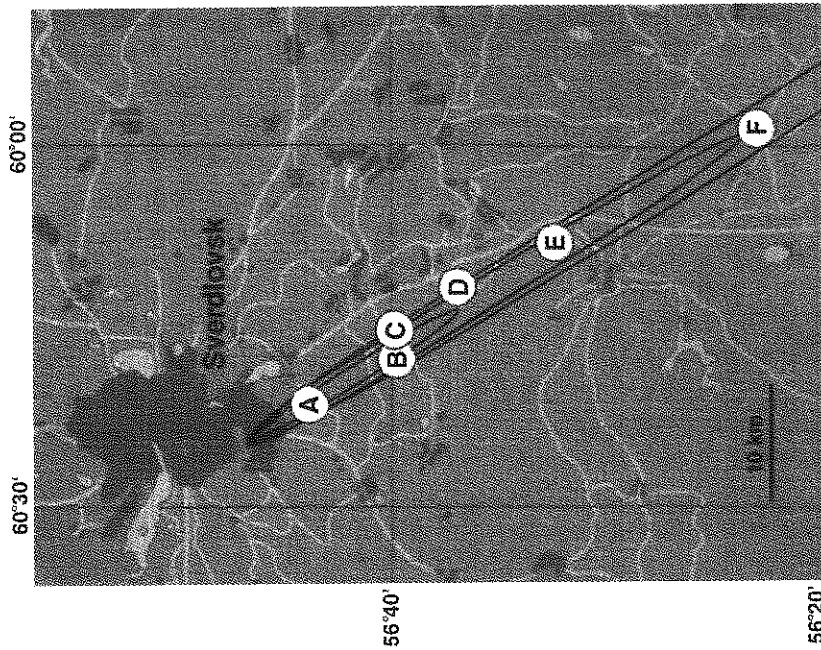


Figure 4. Map of Sverdlovsk region and the wind-speed evidence. The map on the left shows Sverdlovsk and the countryside directly to the south of it. The letters indicate the six villages that reported cattle dying of anthrax in April 1979: A, Rudnyi; B, Bolshoye Sedelnikovo; C, Maloye Sedelnikovo; D, Pervomaitskiy; E, Kashino; and F, Abramovo. The black ellipses indicate calculated contours of constant dosage. On the right are wind-speed measurements from Koltsovo airport from 2 to 4 April 1979. (Reprinted with permission from Matthew Meselson, Jeanne Guillemin, Martin Hugh-Jones, Alexander Langmuir, Iiona Popova, Alexis Shelokhov, and Olga Yampolskaya, "The Sverdlovsk Anthrax Outbreak of 1979," *Science*, 266 [18 November 1994], 1205-1206. Copyright 1994 American Association for the Advancement of Science.)

of it could destroy the whole edifice of biological arms control. Sverdlovsk itself became a model for all arms-control disputes. In particular, it served to expose the real problem in the BWC: "namely, the lack of verification provisions."¹⁰³

The disintegration of the old faith in verification was not gradual: it began with the SALT II verification crisis of 1981. SALT II failed because there were unsubstantiated allegations that SALT I had been violated by the Soviets, and hawks in the U.S. Senate saw no reason that they should commit the United States to a treaty when there was no mechanism to guard against a recurrence of transgressions. Although SALT II was rejected by the Senate, removing any obligation to adhere to the treaty, Reagan promised that the United States would still stick to the letter of the treaty as long as the Soviets did. Reagan's compromise was the best of both worlds: as soon as a "politically significant" violation was detected, the United States could back out of the treaty without losing face.

Of course, SALT II signified much more than proselytizing about arcane treaty standards. It fell, first and foremost, because Afghanistan, human rights violations, and the alleged SALT I violations all showed that the time for détente treaties had passed, thus bringing verification ever more prominently into the spotlight: "The debate over SALT II and its verification neither defused the verification issue nor resolved the doubts. Indeed, given the combined effects of Iran, the 1980 election, and odd limbo into which the treaty slipped, verification probably became even more politicized."¹⁰⁴ The first actor on this hard-line stage was CBW arms control. As the twin CBW debates of Sverdlovsk and Yellow Rain began to develop, they were inserted into the SALT II context. They were used as aces in the poker game of treaty negotiation. This was felt by the State Department to be the clearest way to show the Soviets the new rules of international diplomacy.¹⁰⁵

In the beginning this was a minority view. The dominant early attitude, especially during the Carter years, was to dismiss the evidence in the hopes that SALT could be saved. One of the reasons the Sverdlovsk hearings were held in June 1980 was to see if the Carter administration was guilty of with-

¹⁰³ Raymond A. Zilinskas, "Anthrax in Sverdlovsk?" *Bull. Atom. Sci.*, 39 (June-July 1983), 27. See also Gelb, "Keeping an Eye on Russia" (above, n. 21), p. 31.

¹⁰⁴ Mark M. Lowenthal and Joel S. Wit, "The Politics of Verification," in *Verification and Arms Control*, ed. William C. Potter (Lexington, Mass.: Lexington Books, 1985), p. 161. See also John H. Barton, *The Politics of Peace: An Evaluation of Arms Control* (Stanford: Stanford University Press, 1981), pp. 165-166.

¹⁰⁵ See especially Jim Leach's testimony in U.S. Senate, Subcommittee on Arms Control, Oceans, and International Operations, Committee on Foreign Relations, "Yellow Rain" and Other Forms of Chemical and Biological Warfare in Asia (10 November 1981), p. 11: "If the Soviets are not prepared to be forthcoming in negotiating a verifiable ban on chemical weapons, they can have little expectation of meaningful progress in other arms control areas."

holding pertinent information from Congress while trying to get SALT II passed.¹⁰⁶ While there was still hope for SALT II, even hard-liner Reagan ignored Yellow Rain and the plight of the Hmong: "In the big picture, SALT and the USSR are far more important than a couple of hundred thousand Hmongs in an area where we don't have any interest," said an anonymous Reagan administration official.¹⁰⁷ This may appear a little severe, but the evidence shows that the timing of the allegations was placed well after Carter (in the case of Sverdlovsk) and Reagan (for Yellow Rain) had any hope of ratifying SALT II.

Sverdlovsk was held up as a template for what *not* to do in verifying a treaty. The lesson was to try to gather some sort of baseline of objective, scientific evidence when possible and then to use that to make structured scientific arguments. Unfortunately scientific evidence had never been the mode of international discourse. Philip Towle, in one of the earliest summaries of Sverdlovsk, saw the allegations raised in Geneva in 1980 as a conscious attempt to bury the corpse of 1970s détente. Just as the political goals of the time had shifted, so the mechanisms for achieving those goals had to be replaced. Using an unverifiable treaty intended to improve international relations to destroy détente expresses one of the internal ironies of loose verification: "[U]nverified agreements may improve the political atmosphere during a period of détente but may have the reverse effect when relations deteriorate. They act, therefore, like a flywheel, accentuating existing trends."¹⁰⁸ Since only experts claimed to be able to interpret the data, most government analysts and the general public were left ignorant of the implications of the findings. Sverdlovsk demonstrated the inherent difficulty of weeding out internal prejudices when proving a CBW violation while highlighting the *specific* inadequacies of the BWC by demonstrating the need for an independent body to conduct on-site inspections; a BWC without such measures was unverifiable.¹⁰⁹

Either Sverdlovsk or Yellow Rain alone would have been enough to precipitate a severe crisis in arms-control philosophy, but conflated they formed one general statement about the inadequacy of then-current verification protocols.

¹⁰⁶ Sverdlovsk Hearings (above, n. 19), p. 1.

¹⁰⁷ Quoted in Michael A. Lerner, "Yellow Rain Dance," *New Republic* (3 February 1982), p. 15. This attitude is also ascribed to the Carter administration specifically in Jane Hamilton-Merrit, *Tragic Mountains* (Bloomington: Indiana University Press, 1993), p. 415. Robert J. Einhorn, "Treaty Compliance," *Foreign Policy*, 45 (winter 1981-1982), 44, describes this as a general phenomenon.

¹⁰⁸ Towle, "Soviet Union and the Biological Weapons Convention" (above, n. 52), p. 39. See also Alan F. Neidle, "The Rise and Fall of Multilateral Arms Control," in *Arms Control: The Multilateral Alternative* ed. Edward C. Luck (New York: New York University Press, 1983), p. 27, for this point on verification specifically applied to Sverdlovsk.

¹⁰⁹ Flowerree, "Possible Implications of the Outbreak in Sverdlovsk" (above, n. 26), p. 111.

To an extent, this desire for verification relied heavily on an oversimplified view of science that assumed that a single interpretation of evidence was always possible. The two incidents were symptoms of the common disease of allowing standards of evidence for treaty violations to be influenced by the political climate. Since complete isolation from political trends was impossible, many argued that the more insulated and independent the standards of evidence were (i.e., the more "scientific" they were), the more likely one was to not make faulty allegations, preserving faith in arms control.¹¹⁰ More specifically, these two allegations brought the problematic signal-noise dilemma to everyone's attention:

Similar problems in distinguishing signal from (natural) noise arise in monitoring connected with the biological weapons treaty. Most of the diseases and toxins currently considered for use in biological warfare occur naturally. Thus, verification requires a judgment as to whether what one is observing is a natural event or the traces of a violation. The Sverdlovsk incident . . . and the evidence of lethal toxins present in combat areas of Southeast Asia are two recent examples.¹¹¹

In fact, at the Third Review Conference of the BWC, the two cases were singled out as specific causes of a need for reevaluation of the treaty.¹¹² The challenge then became for the diplomats to change the treaty philosophy to fit the problem.

It is not possible to look at the violations of the BWC, SALT, or the Geneva Protocol separately. It was not the case that one of these treaties was shown to be unverifiable and profusely violated, and as a consequence that particular treaty, and that treaty alone, was considered useless. Each of these treaties had manifold implications for the others. While Iraqi use of chemical weapons in the Iran-Iraq war showed the need for a CWC to replace the Geneva Protocol, it was not particularly easy to link any verification structure with the protocol. The known verification mechanisms of the early 1980s were *all* under criticism, and it was necessary to reform the general mindset to produce a viable CWC. Fortunately, there was a clear indication of what was needed. If one could incorporate the lessons of gathering proof and

¹¹⁰ Harris, "Sverdlovsk and Yellow Rain" (above, n. 24), p. 95; and Elisa D. Harris, "CBW Arms Control: A Regime Under Attack?" *Arms Control Today*, 16 (September 1986), 9.

¹¹¹ Stephen Meyer, "Verification and Risk in Arms Control," *International Security*, 8 (spring 1984), 115-116.

¹¹² Goldblat and Bernauer, *Third Review Conference* (above, n. 17), p. 14. The inherent difficulties of adversarial verification, as detailed earlier, were also pointed out in diplomatic contexts. See Joseph Finder, "Biological Warfare, Genetic Engineering, and the Treaty That Failed," *Washington Quarterly*, 9 (spring 1986), 13.

international diplomacy from both Yellow Rain and Sverdlovsk, a verifiable CWC might be created.

"Science" became the key word for almost all the new verification proposals, although in the current debate over Gulf War syndrome we can see that the U.S. government is unable to forge a consistent standard of evidence even when investigating its own activities. This was even worse with respect to foreign nations. Within the BWC, for example, there was no mechanism for prompt scientific mobilization; without this mobilization, samples would decay and there would be no verification.¹¹³ One of the proposals at the Second Review Conference was to mobilize scientific organizations for verification purposes: "They could provide a noncontroversial and impartial forum for monitoring the success of the measures already agreed upon and for determining how they need to be broadened. . . ."¹¹⁴ This hope of the impartiality of scientists stood in unexplained tension with the long tradition since World War II of scientists providing a substantial core of arms-control advocates, ranging from Robert Oppenheimer to Linus Pauling, to his former graduate student Matthew Meselson.¹¹⁵ The award of the 1995 Nobel Peace Prize to the Pugwash Organization, another such group of scientists who mobilized especially on nuclear arms control, is just another demonstration of the vigilance of this community, and the faith that international arms controllers had in them.

These general concerns were turned into specific plans of action for the CWC. One of the most important proposals for a verification mechanism for the CWC was that for a Scientific Advisory Board (SAB), which would have a permanent membership and could be mobilized instantly to investigate allegations of CBW use. It would also have been granted entry and jurisdiction over all signatories in advance so that investigation would be faster. Pierre Canonne listed the benefits of this option:

It is only under such circumstances that independent advice can be offered freely and in a responsible way by a body which has no vested interest. In the absence of this, the risk is that any technological or scientific development will stimulate discussions and disagreements amongst the States Parties or with the Technical Secretariat. In such a case the established bodies of the Convention would of course have to take the necessary decision. But any such decision will be made most rapidly and clearly if

¹¹³ Paul G. Cassell, "Establishing Violations of International Law: Yellow Rain and the Treaties Regulating Chemical and Biological Warfare," *Stanford Law Review* (January 1983), 273.

¹¹⁴ Rosenberg, "Updating the Biological Weapons Ban" (above, n. 56), p. 43.

¹¹⁵ Barton, *Politics of Peace* (above, n. 104), p. 74.

it is based on impartial opinions such as would be provided by an SAB vested with incontestable scientific authority and independence.¹¹⁶

Such proposals show how much the lessons of Yellow Rain and Sverdlovsk, as they were perceived by the broader arms-control community, were internalized and applied to the CWC. The way to avoid more debacles was to have a permanent team of Matthew Meselsons on call to investigate allegations. It was hoped that such a body could gather enough forensic evidence to present to the UN for the final decision on compliance.¹¹⁷

The Chemical Weapons Convention – completed in 1993 – is an exceedingly long treaty. Whereas the Geneva Protocol takes up slightly more than half a page, and the BWC spans four pages, the CWC encompasses more than 174 pages of dense text, with very detailed provisions of what specifically is banned and how those bans are enforced. While the BWC has less than one sentence on how to conduct verification, there is an annex to the CWC that provides for the mechanisms of verification and enforcement for well upwards of 100 pages (its table of contents alone is longer than the entire BWC). Examination of this protocol shows how well the lessons of the 1980s were absorbed. First of all, extensive structures for both scheduled on-site inspections and challenge inspections were provided for specific incidents. The mechanism for setting up a group of independent investigators was written into the treaty instead of having the UN put one together haphazardly (as it did in the case of Yellow Rain). The activities that were permitted in the Convention were specifically detailed and were closely monitored to minimize the signal-noise ratio. The format for judging allegations and for collecting evidence was outlined with a uniform consensual standard.¹¹⁸

These elements were all directly born of the Sverdlovsk and Yellow Rain debates. I do not mean to argue that the entire CWC is a product of these two debates – far from it. The CWC is a groundbreaking treaty in many respects, each of which is the end result of a revolution in some aspect of arms-control theory. To trace fully the history of this treaty from 1972 to 1993, when it was finally signed, would be a project much more ambitious than this one. One would have to follow the decline of sovereignty in international law, the rise of industrial chemistry, and the multistage process of the categorization of dangerous chemicals in terms of schedules. The implementation structure

¹¹⁶ Pierre J. M. Canonne, "The Role of the Scientific Community within the Context of the Convention," *Chemical Weapons Convention Bulletin*, 24 (June 1994), 2.

¹¹⁷ Graham S. Pearson, "Prospects for Chemical and Biological Arms Control: The Web of Deterrence," *Washington Quarterly*, 16 (spring 1993), 152.

¹¹⁸ United Nations Centre for Disarmament Affairs, *Disarmament: The Chemical Weapons Convention with Selective Index* (New York: United Nations, 1994).

was inextricably tied to the growth of the UN's power after the Gulf War. In short, the CWC is far more complicated than a single verification protocol.

I propose that now we can return to the question that began this section and examine why Meselson's attitudes toward the incident at Sverdlovsk were so different from those he took with respect to other verification disputes, like Yellow Rain. I would argue that Meselson pursued the scientific method here as he understood it – in the classical textbook definition – but his initial predispositions still apply when viewed in a larger context. When both the Yellow Rain and Sverdlovsk allegations were aired at the same time, Reagan was waging the Cold War, and it seemed possible that the entire arms-control regime would collapse. It was not only bilateral treaties like SALT II that were to fall; the high standard of verification proposed by the hawks who rose from the ashes of détente directly threatened the multilateral treaty structure as well. The first victim was to be the BWC – destroying all that Meselson had worked for.

But in 1994, when the new data were synthesized and analyzed by Meselson, the international treaty climate for CBW was wholly different. The Soviet Union had passed out of existence on Christmas 1991, and there was new hope that a Chemical Weapons Convention with real teeth and real verification measures would be signed. With no need to fear that CBW arms control would collapse and having new data to analyze, Meselson had no need to be defensive and could once again reopen the Sverdlovsk case. I contend that this psycho-political argument offers a useful explanation of the interaction between Sverdlovsk and Yellow Rain. Meselson now wanted to be able to show how scientists could work to establish the verity of certain allegations in the face of significant evidence to the contrary. International conditions had changed, which allowed for a whole new way to look at arms control, and, as a direct consequence, a whole new way to verify allegations of CBW use.

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